LAWRENCE LIVERMORE
REPORT

A weekly collection of scientific and technological achievements from Lawrence Livermore National Laboratory, Oct. 11-Oct. 15, 2010

The big NIF picture

The NIF target chamber.

The goal of the largest and highest-energy laser on earth -- the National Ignition Facility -- is to create a miniature star on Earth, also known as fusion.

Livermore scientists are on their way to achieve fusion. Late last month, NIF scientists completed their first integrated ignition experiment, where it focused its 192 lasers on a small cylinder housing a tiny frozen capsule containing hydrogen fuel, briefly bombarding it with 1 megajoule of laser energy.

The experiment was the latest in a series of tests leading to a hoped-for "ignition," where the nuclei of the atoms of the fuel inside the target capsule are made to fuse together releasing tremendous energy -- potentially more energy than was put in to start the initial reaction, becoming a valuable power source.

To see photos, go to the Web.

Sierra skyrockets to new heights

Al Chu (left) and Ryan Braby check Sierra, which is housed in an LLNL computer room.

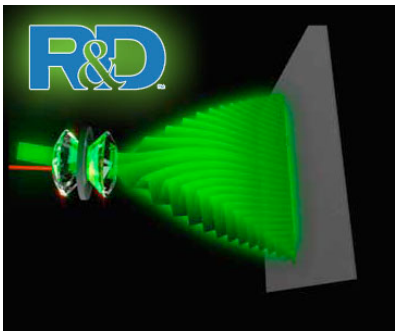
High-performance computing in the unclassified arena will soar to new heights with the recent installation of Lawrence Livermore's Sierra.

With a peak speed of 261 teraflops (trillion floating operation per second), Sierra will become the most powerful high-performance computing (HPC) resource available for unclassified research at LLNL. The new system was brought in for the Lab's Multi-programmatic and Institutional Computing (M&IC) program to support Laboratory Directed Research and Development (LDRD), Grand Challenge and other unclassified research efforts.

Research areas requiring Sierra's number-crunching power include: climate modeling and atmospheric simulations, supernovae and planetary science, materials and strength modeling, laser and plasma simulations, and biology and life sciences.

To read more, go to the Web.

Sound measure is material to explosive tests



HBO_2, a highly photosensitive and reactive material, was encapsulated and pressurized using a heated diamond-anvil cell.

A team of Laboratory scientists have developed a new, adaptable and precise technique to measure the speed of sound in materials that will help improve large-scale explosive testing.

The new technique is more versatile and technically easier to use compared to two primary conventional techniques that are technically challenging and require relatively high fluence beams or pulses, which can induce photoreactions or physically alter sample properties.

Large-scale high explosive testing is dangerous. The new method addresses a 60-year-old challenge -- to engineer explosive formulations with metal fuels to reach a desired level of performance. The team paved the way to use a semi-empirical approach, which will provide guidance for large-scale tests, ultimately saving time, capital and human lives.

Quantitative predictions of extreme-condition chemistry are unequivocally linked to knowing the equations of state (EOS) of probable major reaction species, typically in the liquid state. It is not unusual for such endeavors to be hindered by a near, if not total lack of critical experimental data.

To read more, go to the Web.

And the project of the year award goes to…

Lawrence Livermore's National Ignition Facility

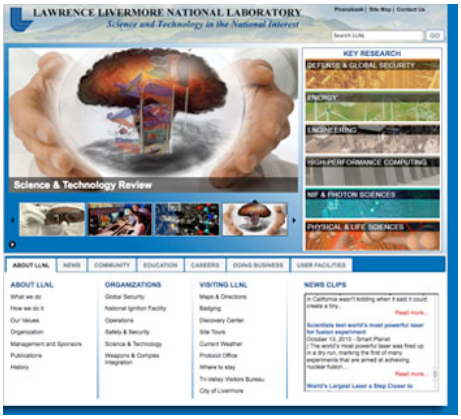
Citing groundbreaking technical achievement and exemplary management, NIF, the first laser expected to achieve fusion ignition in a laboratory setting, has been awarded the Project Management Institute's (PMI's) 2010 Project of the Year.

The award, presented recently during a special ceremony in Washington, D.C., recognizes the year's most innovative and successful project.

Late last month, NIF scientists have fired their first shot at a capsule containing fusion fuel. The aim is to show that by using lasers to compress and heat the tiny peppercorn-sized capsule to conditions more severe than in the center of the sun, they can get the hydrogen fuel to fuse and release large amounts of energy. Such a process, if successful, could form the basis of a future energy-producing reactor.

To read more, go to the Web.

The new face of LLNL



In an effort to give the Lab's Web presence a more contemporary look and ease of use, the Laboratory has rolled out a new external Web page.

The new portal is the first phase of a multi-year effort to upgrade LLNL's external Web pages by providing more multi-media content -- graphics, animation and video -- to better highlight Laboratory research.

Rollout of the new external page brought an end to *Newsline,* the Lab's weekly news magazine. News content and features from *Newsline* will be integrated into the Lab's new external portal.

The new portal offers easier navigability, particularly for visitors unfamiliar with LLNL's organization. News stories and features, press releases and news briefs that were published in the weekly edition of *Newsline* will now appear in a timelier manner as the external portal will be updated daily.

See the new site.

LLNL applies and advances science and technology to help ensure national security and global stability. Through multi-disciplinary research and development, with particular expertise in high-energy-density physics, laser science, high-performance computing and science/engineering at the nanometer/subpicosecond scale, LLNL innovations improve security, meet energy and environmental needs and strengthen U.S. economic competitiveness. The Laboratory also partners with other research institutions, universities and industry to bring the full weight of the nation's science and technology community to bear on solving problems of national importance.

To send input to the Livermore Lab Report, send e-mail mailto:labreport@llnl.gov.

The Livermore Lab Report archive is available on the Web.